UGURCAN CAKAL, M.Sc.

Software Engineer • Zürich, Switzerland *(B-permit)*

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I'm a self-motivated engineer, based in Zürich, with a knack for computers and electronics. I have hands-on experience in hardware-aware software development, especially in areas like machine learning, autonomous robotics, and embedded systems. Adapting to the situation, I can be a strong team player or a one-person army

SKILLS

Programming	**Python (Expert), C++ (Proficient**), C, CUDA, Verilog, ARM Assembly (Competent)
Machine Learning	PyTorch, Jax, TensorFlow, sckit-learn, xNNs, SNNs, MLFlow, pruning, quantization, event-driven
Software	**Git**, Linux, **CI-CD**, Docker, Kubernetes, DevOps, MLOps, unit test, verification, optimization
Language	English(C1), Turkish (Native), German (B1)
Soft	Communication, problem-solving, adaptability, resilience, **agility**, attention to detail

PROFESSIONAL EXPERIENCE

SynSense AG Zürich, Switzerland

ML Algorithms and Applications Engineer July 2022 - Present

- Led the implementation of **application software support** for digital neuromorphic Xylo, and mixed-signal neuromorphic Dynap-SE2 chips. ***Offline simulation**, hardware-in-the loop, SNN training and mapping, **sim-to-real**.*
- **Trained and deployed** application prototypes targeting various Xylo chip families, some of which are human activity detection with IMU signals, and background noise classification with audio signals.
- Spearheaded the development and **maintenance** of Rockpool, an **open-source** python package for developing signal processing applications with spiking neural networks. Currently ranking as the **first contributor (~2,000 commits)**.
- Composed comprehensive user manuals and tutorials and delivered presentations to stakeholders.

SynSense AG (Remote) Zürich, Switzerland

Software Engineer (Intern) Jun 2021 – June 2022

- Modeled the jax-backend time efficient custom hardware simulator, simulating VLSI dynamics of Dynap-SE2 chip.
- Improved BPTT training pipeline execution time from **10s of days to 10s of minutes** with just-in-time compilation.
- Implemented non-uniform quantization, custom gradient computation, mismatch simulation algorithms to solve **hardware mapping** problem for analog mixed signal Dynap-SE2 processor.
- Developed an efficient application deployment pipeline which significantly reduced the required effort for an application development: *from an entire PhD thesis to an internship project.*

GOHM (Remote) Istanbul, Turkey

Machine Learning Engineer (Contract) January 2021 – April 2021

- Engineered a deep convolutional neural network application from scratch, enabling efficient processing of low-dimensional RF signals to **detect analog device fingerprints** for edge inference on the NVIDIA Jetson board.

EDUCATION

Middle East Technical University Ankara, Turkey

Master of Electrical and Electronics Engineering GPA : (3.79/4.0) September 2019 – August 2022

- Courses taken : Neurocomputers and Deep Learning, Applied Parallel Programming on GPU, Artificial Intelligence
- Thesis : DynapSIM: A Fast, Optimizable, and Mismatch Aware Mixed-Signal Neuromorphic Chip Simulator

Middle East Technical University Ankara, Turkey

Bachelor of Electrical and Electronics Engineering GPA : (3.28/4.0) September 2014 – June 2019

- Courses taken : Microprocessors, Computer Architecture I & II, Computational Intelligence, Machine Learning

PROJECTS

DVS Gesture Classification METU, Ankara, Turkey

Machine Learning, Computer Vision November 2020 – January 2021

- Benchmarked two CNNs (3D-CNN, CRNN) using PyTorch on IBM DVS128 gesture dataset.

- Developed a custom **AER** event processing framework for **event-based cameras.**

Eye Tracking ADM Tronics, New Jersey, USA
Embedded Sytems, Computer Vision December 2020 – January 2021
- Engineered a real-time application to detect, track and overlay a human pupil and iris using an active-IR camera

Chase and Tag Robot, B.Sc. Capstone Design Project METU, Ankara, Turkey
Robotics, Computer Vision October 2018 – June 2019
- Designed and assembled a cost-effective **autonomous robot car** capable of chasing another robot along a closed path and tagging the opponent, with a **vision-based motion planning** algorithm, and an ad-hoc Wi-Fi communication.
- Authored comprehensive documentation including conceptual design, critical design review, implementation reports, and a user manual, demonstrating attention to detail and thorough project documentation capabilities.

Custom MIPS Architecture Design METU, Ankara, Turkey
Computer Architecture February 2019 – June 2019
- Implemented a single cycle and a multi cycle MIPS processor using Verilog HDL with automated test benches

Classification for Detection of FOD ArgosAI, Ankara, Turkey
Machine Learning, Computer Vision November 2018 – January 2019
- Built and deployed a convolutional neural network using TensorFlow, which can **classify foreign object debris** on the airport pavements as bird, metal, and plastic; using a proprietary dataset provided by ArgosAI company.

Battleship Game Console METU, Ankara, Turkey
Embedded Systems November 2018 – January 2019
- Remodeled the famous game Battleship on TM4C123G Board and NOKIA 5110 LCD Screen using assembly language

NON-TECHNICAL

- **Chaired** METU Amateur Photograph club for 2 years between 2015 – 2017 organizing several workshops, exhibitions, artist talks and initiating several tenders.
- **Tutored** high-school students for university entrance exams for 5 years between 2013 – 2018.
- Interested in analog photography, modern art, home-brewing, board games, and calisthenics.